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Kobayashi

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(54) **SPEAKER GASKET AND ITS MANUFACTURING METHOD, AND SPEAKER DEVICE**

(75) Inventor: **Shinji Kobayashi**, Chiba (JP)

(73) Assignee: **Sony Corporation**, Tokyo (JP)

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H04R 25/00 (2006.01)

(52) **U.S. Cl.** **381/398**; 381/432; 381/433

(58) **Field of Classification Search** 381/395, 381/386, 152, 396, 398, 403, 404, 423, 424, 381/432, 433, 392; 181/295, 171, 172; 29/594, 29/609.1

See application file for complete search history.

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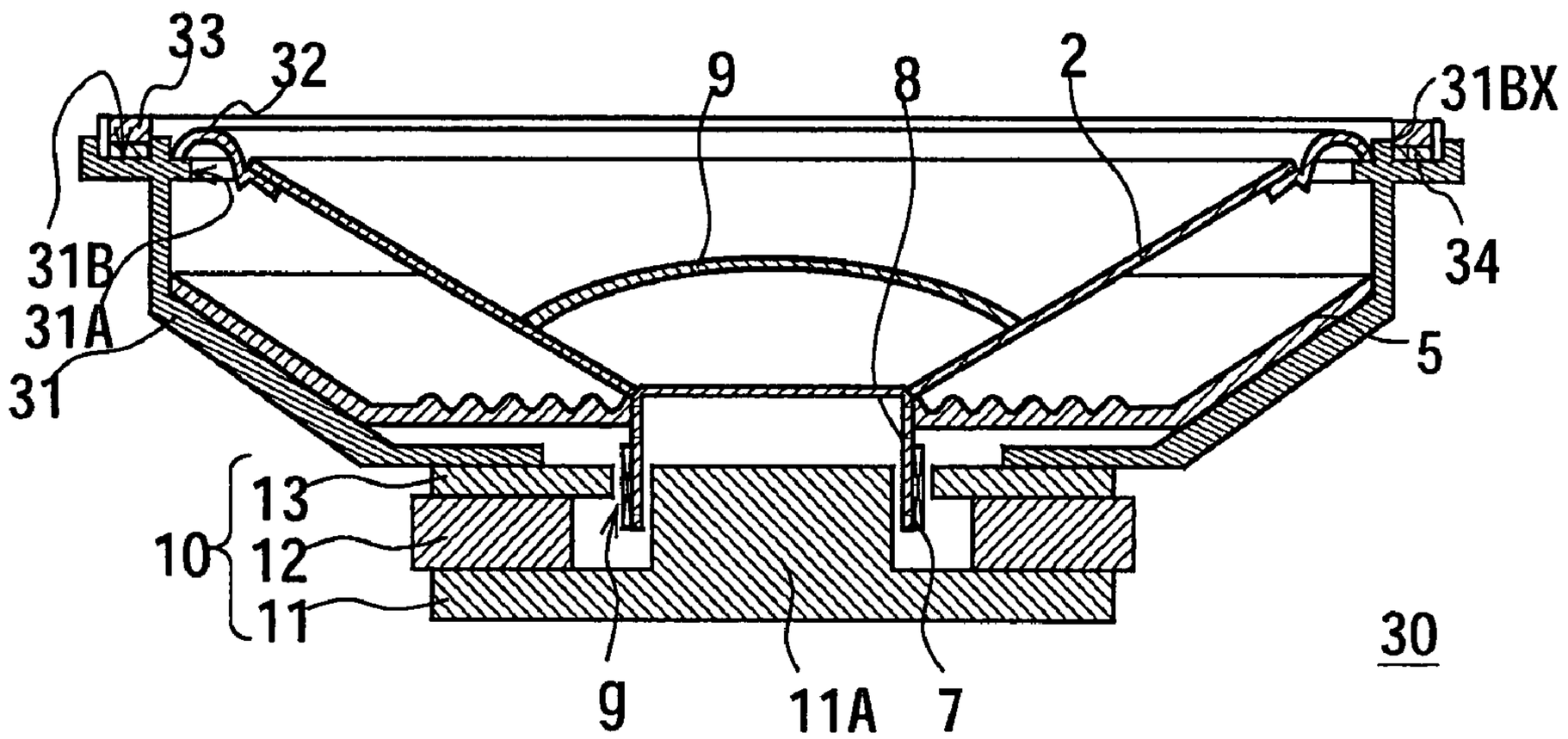
Primary Examiner—Huyen D Le
(74) *Attorney, Agent, or Firm*—Wolf, Greenfield & Sacks, P.C.

(57) **ABSTRACT**

A speaker gasket and its manufacturing method, and a speaker device, the speaker gasket formed by a rectangular sheet with a flat opening of a girth of a prescribed length at the center and capable of significantly reducing the amount of wasteful material in manufacturing, the speaker device offering high reliability.

12 Claims, 5 Drawing Sheets



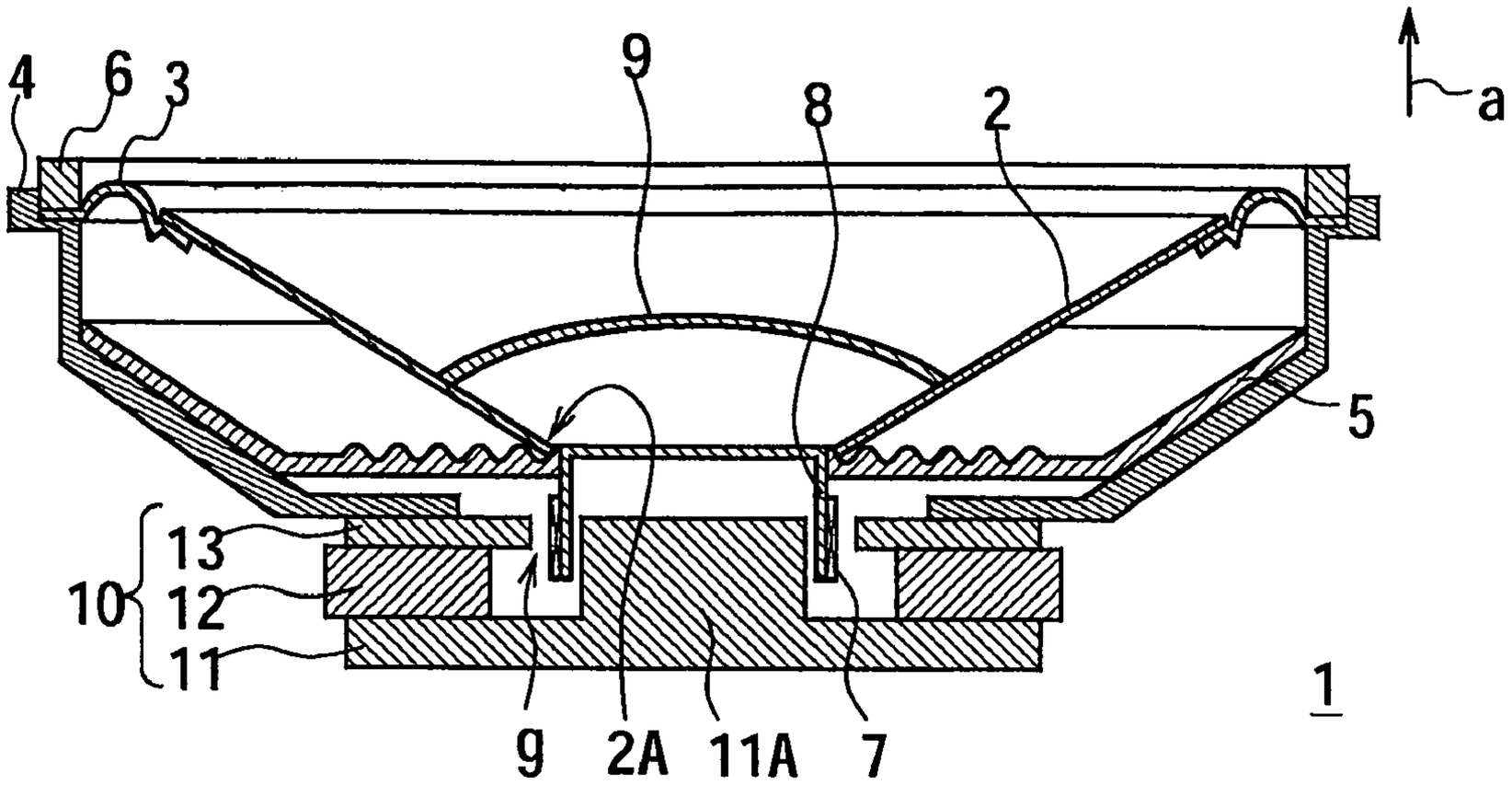


FIG. 1(RELATED ART)

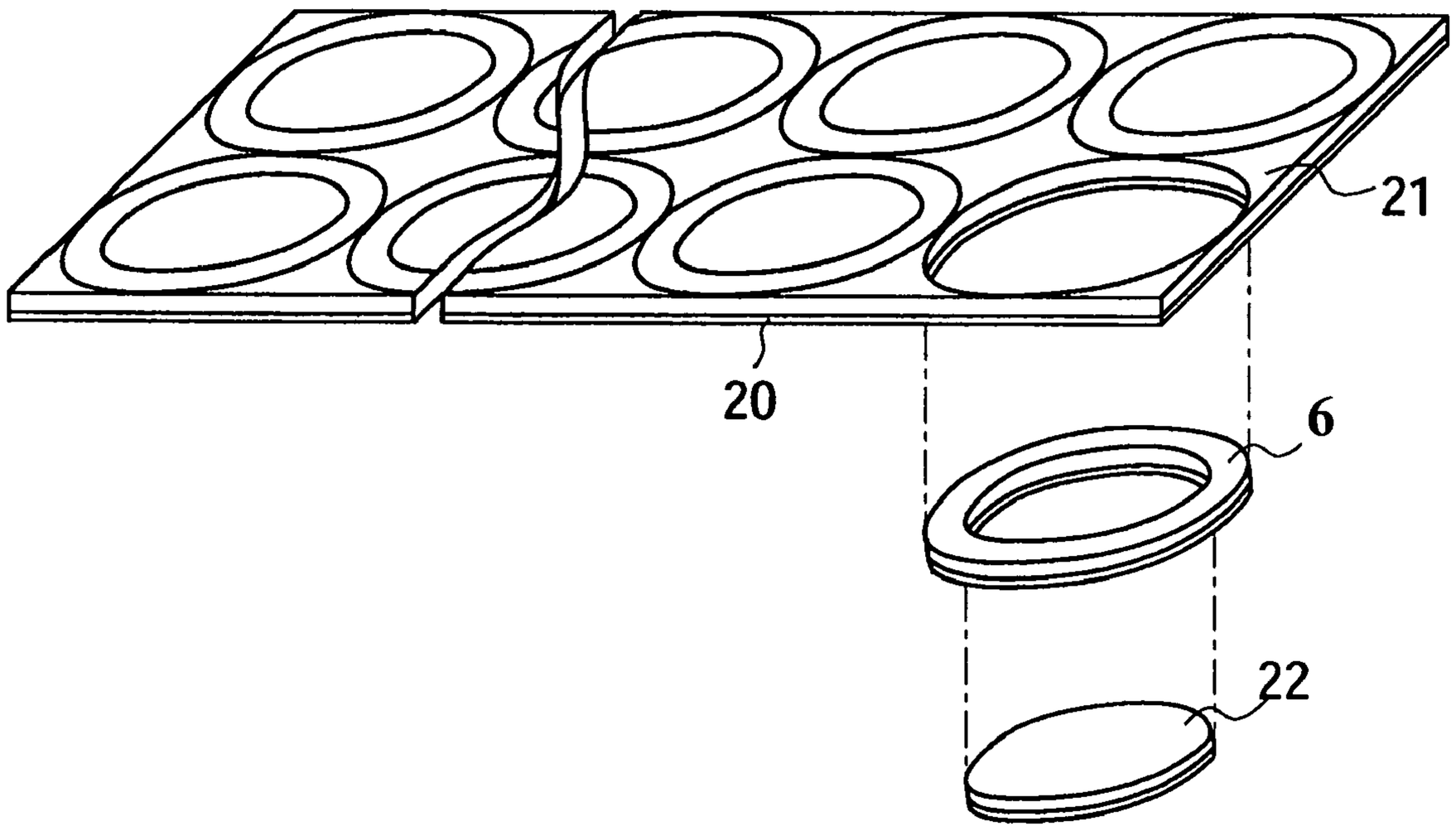


FIG. 2(RELATED ART)

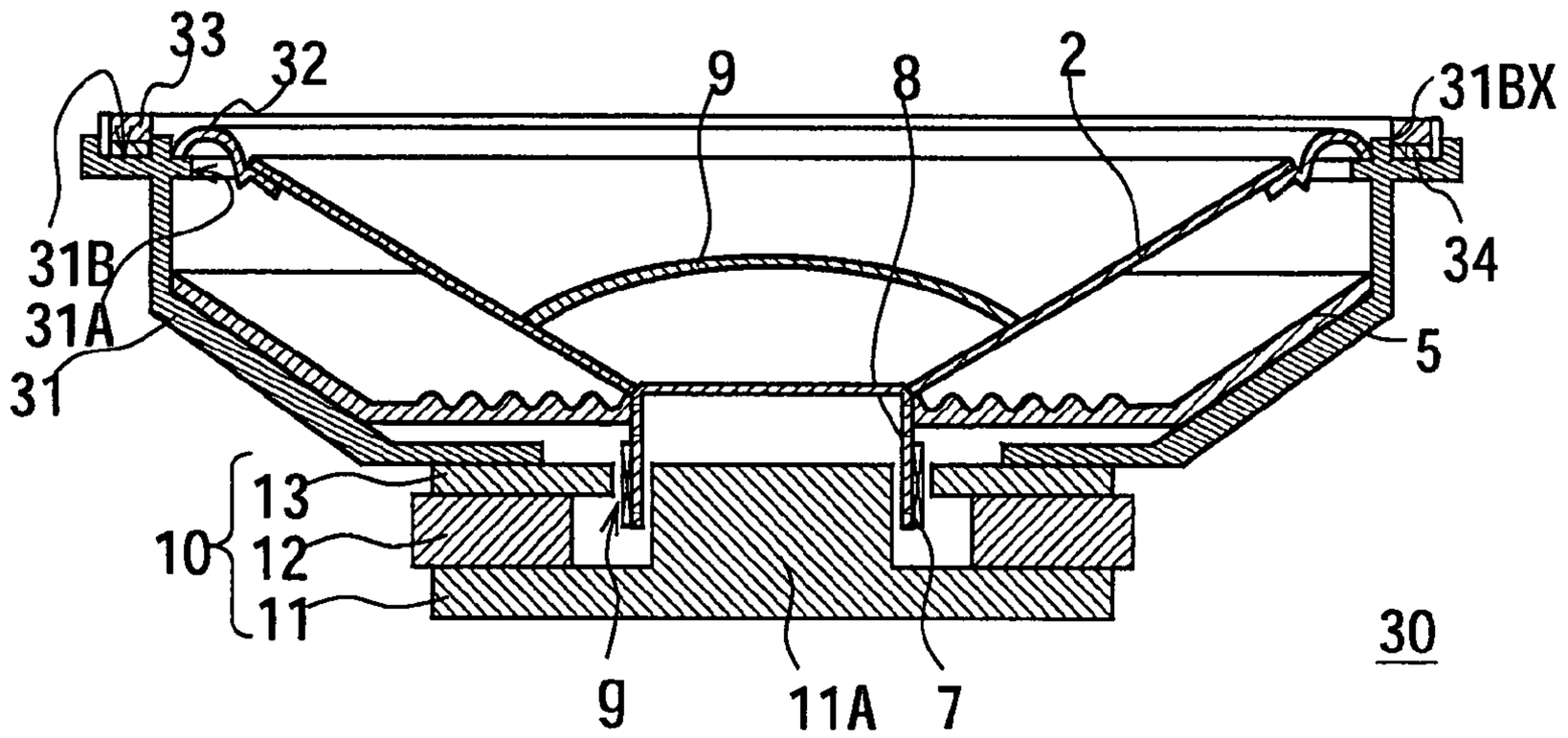


FIG. 3

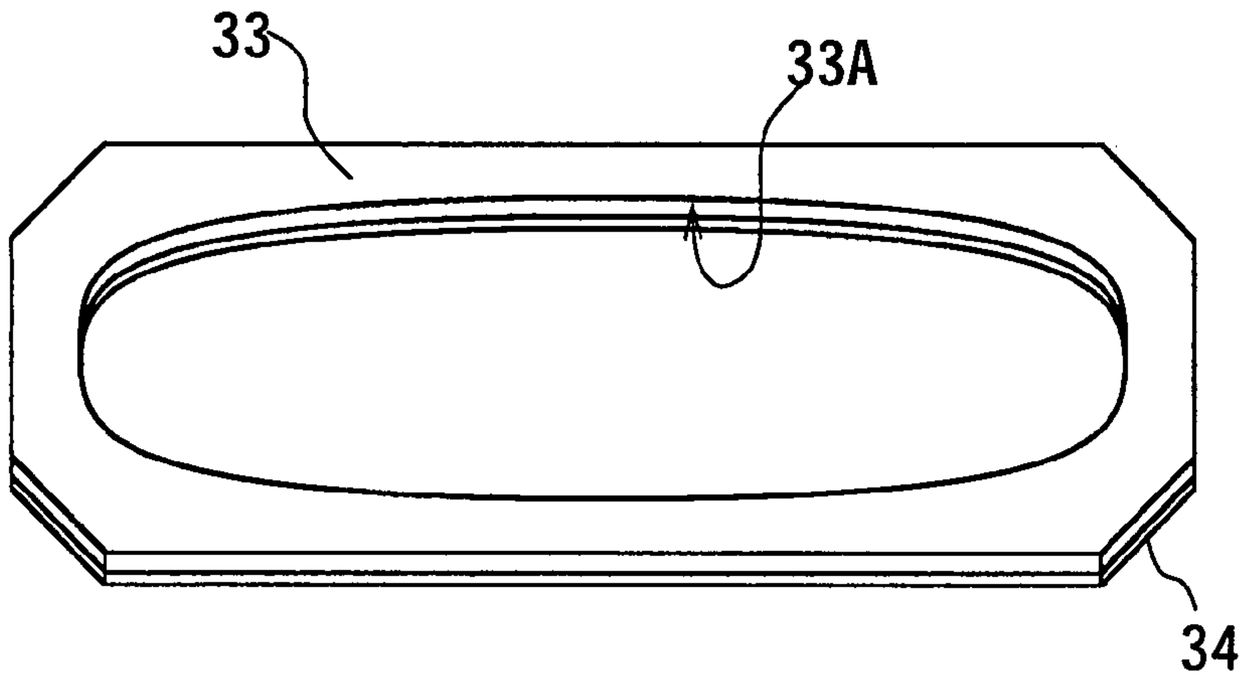


FIG. 4

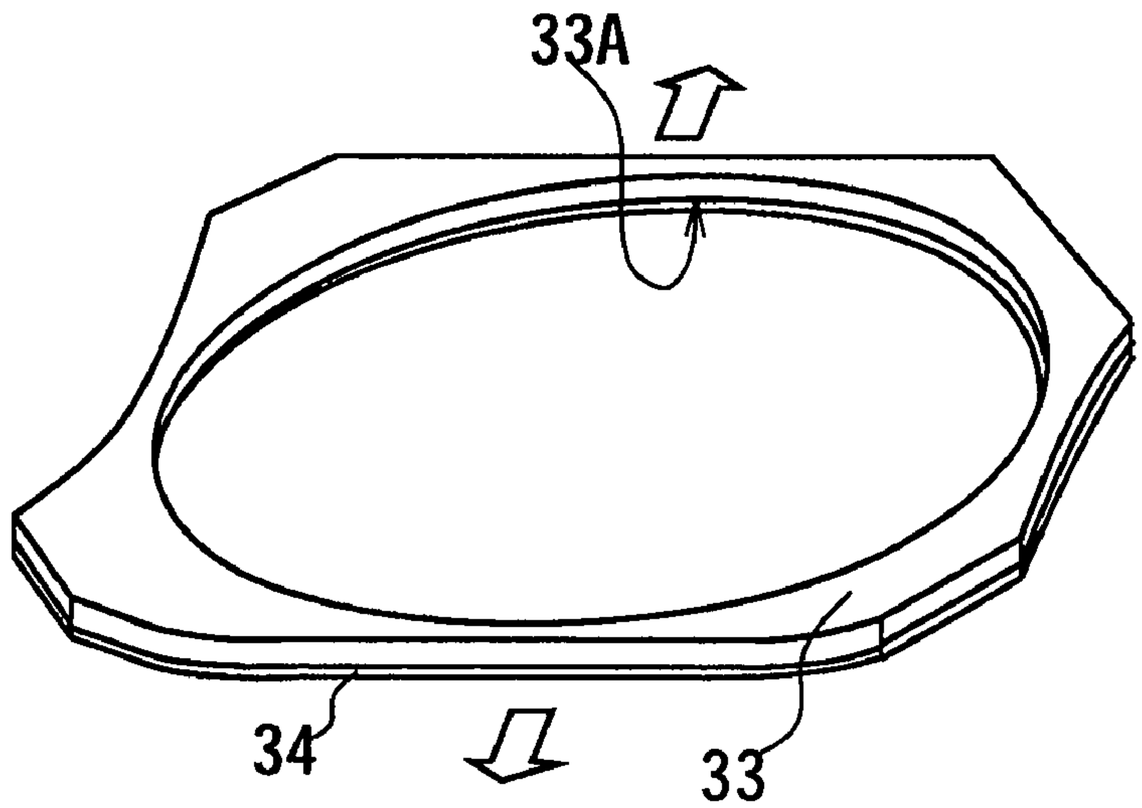


FIG. 5

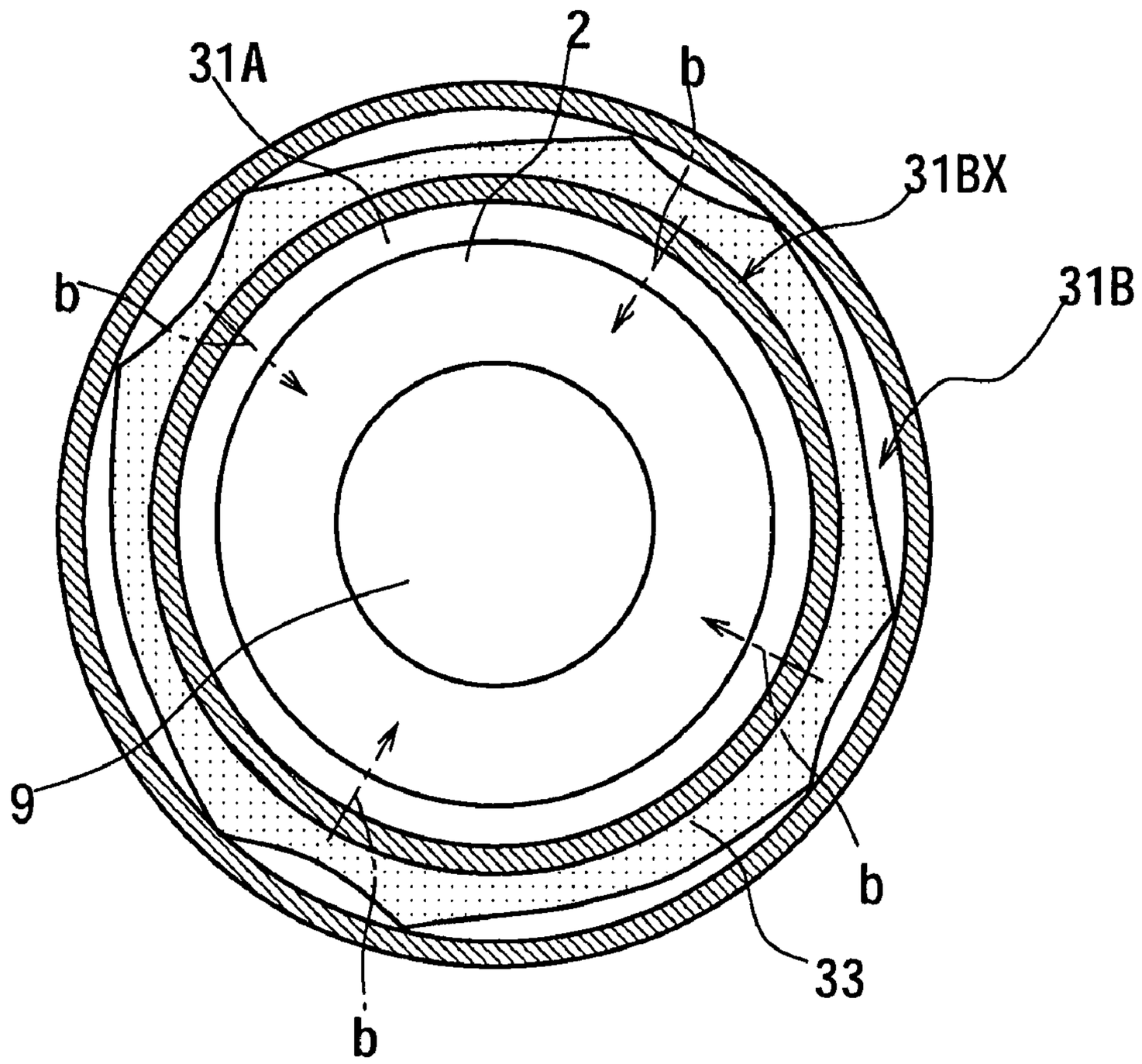


FIG. 6

FIG. 7A

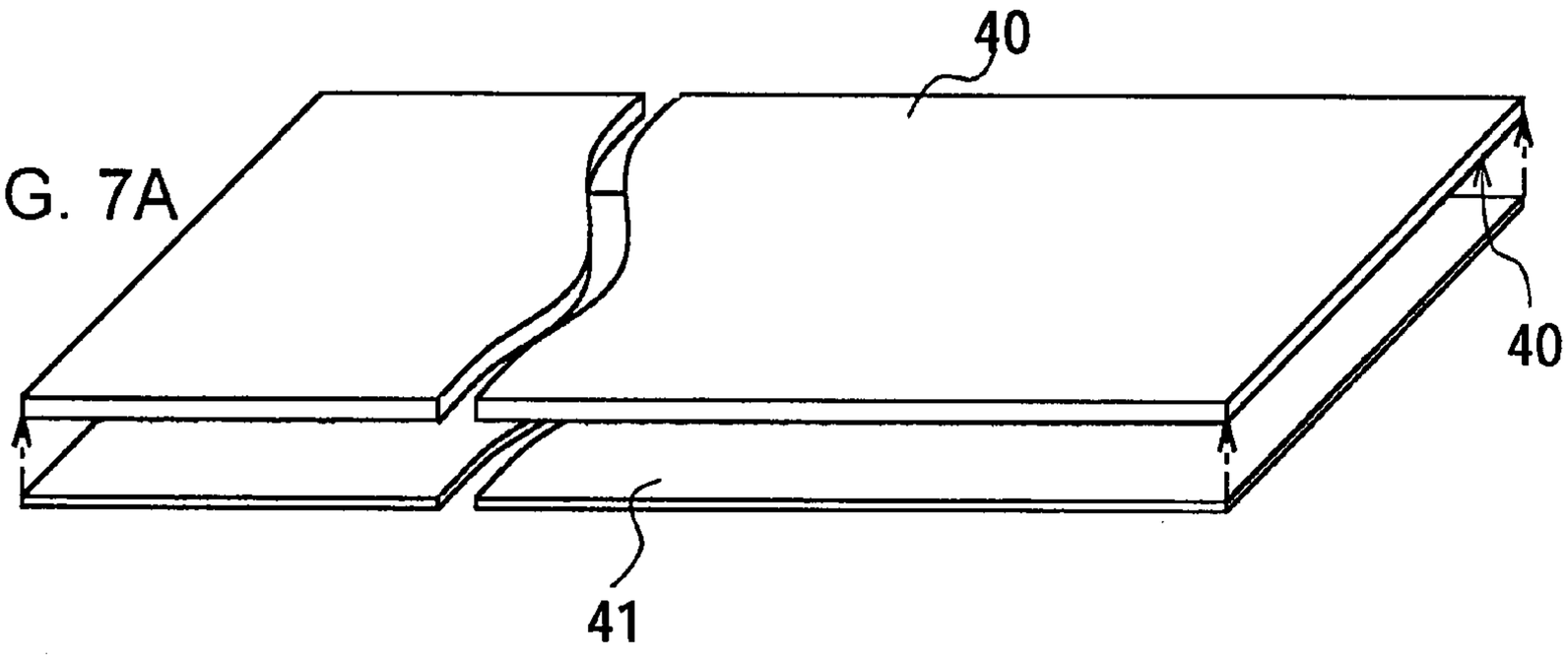


FIG. 7B

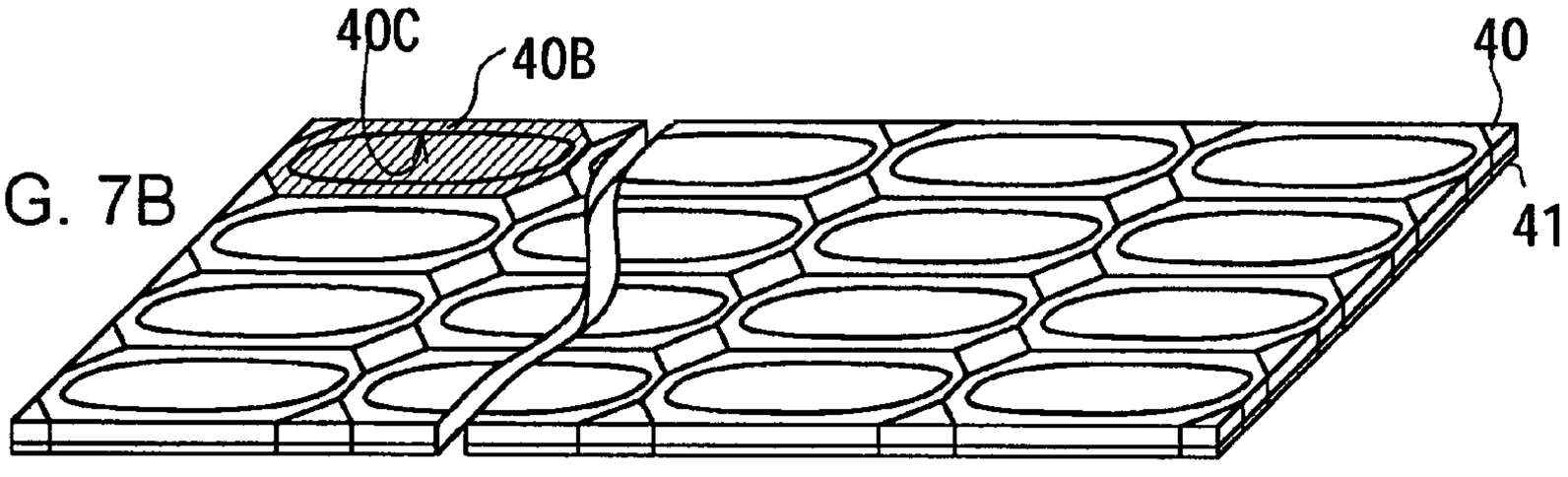
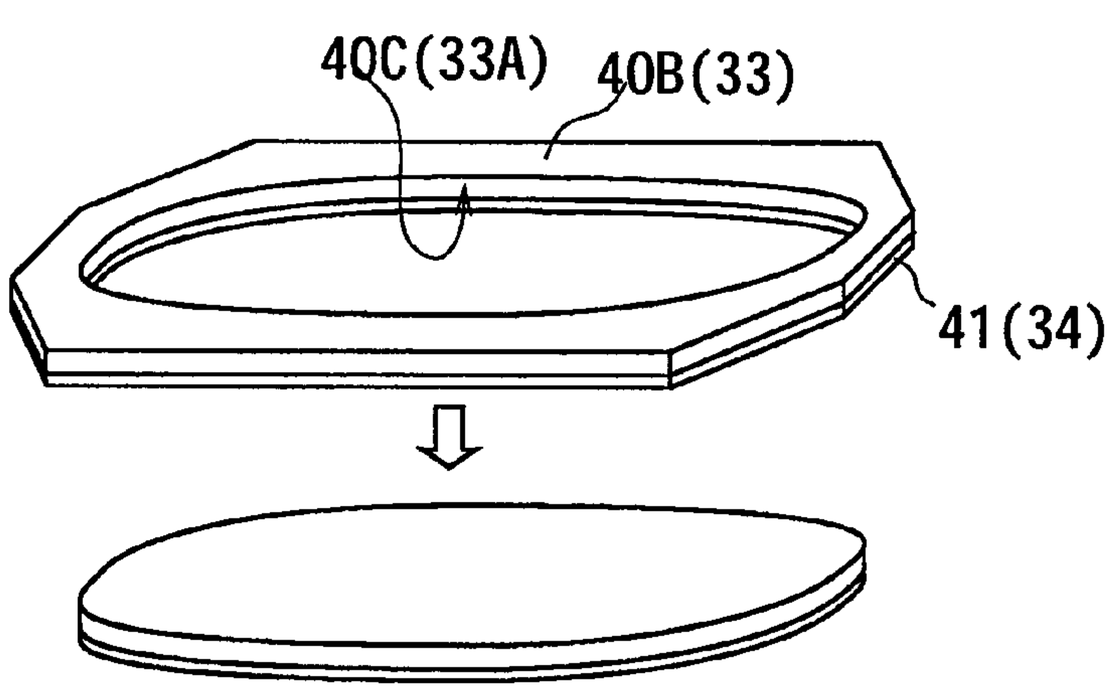


FIG. 7C



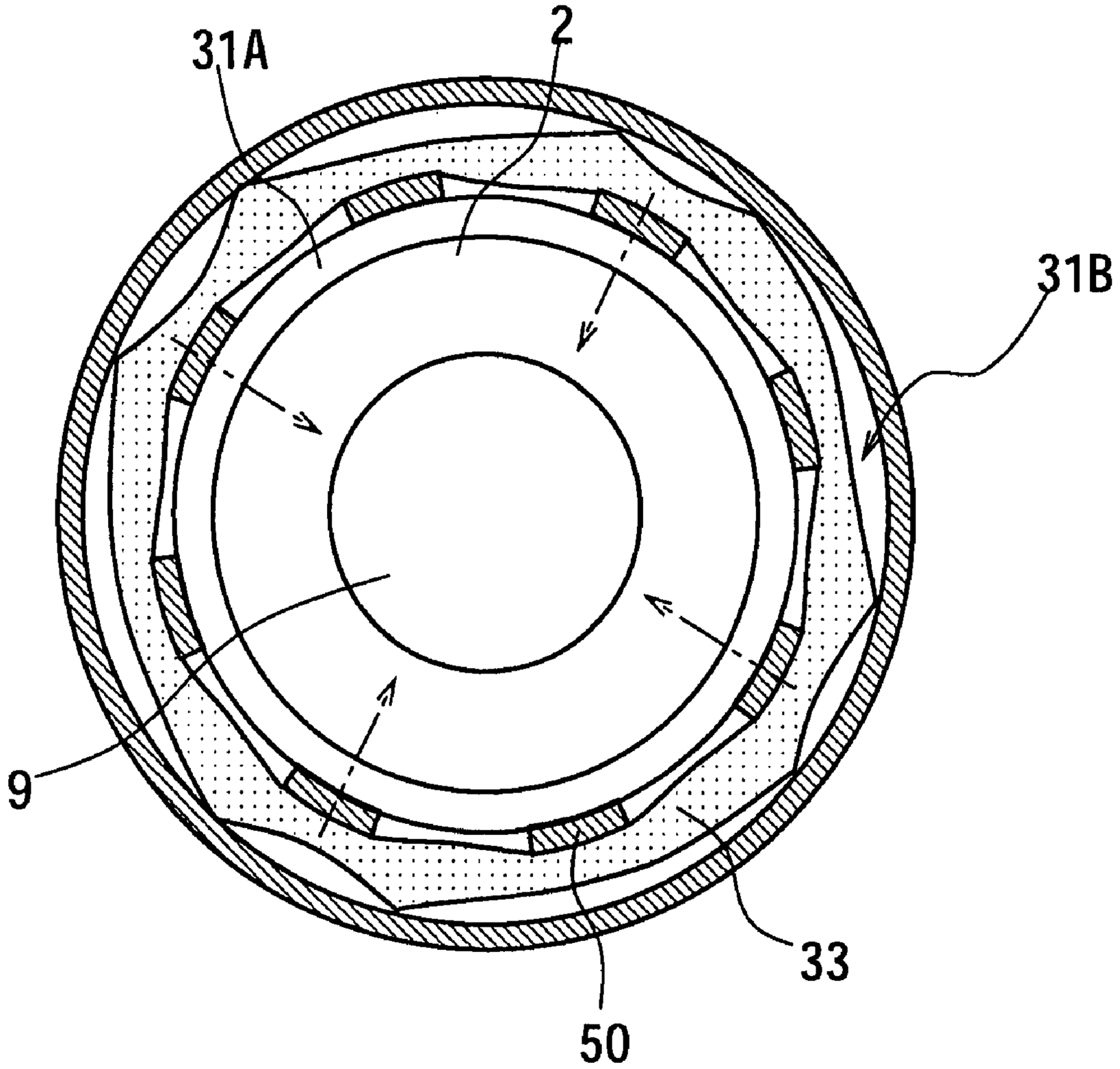


FIG. 8

SPEAKER GASKET AND ITS MANUFACTURING METHOD, AND SPEAKER DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a speaker gasket and its manufacturing method, and a speaker device, and is suitably applied to a cone speaker, for example.

2. Description of the Related Art

There are some cone speakers constructed as shown in FIG. **1**.

Such a cone speaker **1** has a conic cone vibratory plate **2** with its center opened. The outer circumference of the cone vibratory plate **2** is fixed to a frame **4** via an edge **3**, and the inner circumference which is the central part of the cone vibratory plate **2** is attached to a damper **5** fixed in the frame **4**, thereby the cone vibratory plate **2** can be kept so as to vibrate only forwards (arrow a) and backwards without rolling.

In addition, on the outer circumference of the edge **3**, a annular gasket **6** made of rubber or the like is fixed, so that the gasket **6** acts as a buffer when this cone speaker **1** is attached to a speaker box or an internal panel of a vehicle. This can previously and effectively prevent unwanted vibration and generation of noise.

Further, at the inner circumference of the cone vibratory plate **2**, a cylindrical voice coil bobbin **8** having wounded thereon a voice coil **7** comprising a lead line is fixed together with the damper **5**. In front of the opening **2**A at the center of the cone vibratory plate **2**, a hemisphere head cap **9** is attached so as to cover the opening **2**A, with the result that the head cap **9** can previously prevent deformation of the cone vibratory plate **2** in the diameter direction and also prevent dusts from entering the opening **2**A of the cone vibratory plate **2**.

On the other hand, on the bottom of the frame **4**, a magnetic circuit **10** for vibrating the cone vibratory plate **2** forwards and backwards is fixed. This magnetic circuit **10** has a disk yoke **11** provided with a column pole piece **11**A at the center of the top, and a toric magnet **12** is fixed so as to surround the outer circumference of the yoke **11** and a toric plate **13** is laminated and fixed on the magnet **12**.

When the magnetic circuit **10** is attached to the frame **4** so that the top of the plate **13** is fixed to the bottom of the frame **5**, the voice coil bobbin **8** having the voice coil **7** wounded thereon is kept in a contactless manner in a magnetic gap g formed between the pole piece **11**A and the plate **13**.

Thus in the cone speaker **1**, when electromagnetic force is applied to the voice coil **7** according to applied current based on an audio signal externally supplied, the voice coil **7** and the magnet **12** attract and repel each other, thereby generating a sound wave according to the audio signal by vibrating the cone vibratory plate **2** forwards and backwards.

For a manufacturing method of a gasket **6** used in such cone speaker **1**, please refer to Japanese Patent Laid-Open No. 1-256499.

By the way, gaskets **6** used in such a cone speaker **1** are normally produced by cutting a sheet material **21** made of, for example, rubber, having a double stick sheet **20** stuck on its one surface, into rings.

In such the conventional manufacturing method, however, since the sheet material **21** is cut so that ring gaskets **6** have curvature, a ratio of unused parts (wasteful part) to parts which are actually used as the gaskets **6** in the sheet material **21** is large and the wasteful parts are difficult to be recycled and just have to be discarded. That is, the sheet material **21** can not be used effectively.

As one technique to solve such problems, the aforementioned Japanese Patent Laid-Open No. 1-256299 proposes

such a technique as to cut a sheet material **21** into a flat deformed ring which is like a pressed gasket, and deform this ring to attach to the frame **4** of a cone speaker **1**.

In this technique, since the sheet material **21** is cut into flat deformed rings as the gaskets **6**, more number of gaskets **6** can be obtained from the sheet material **21**, resulting in reducing wasteful parts of the sheet material **21**, as compared with the conventional technique.

This technique, however, cannot cut the sheet material into gaskets **6** without wasting parts because the gaskets **6** made from the sheet material **21** are still flat deformed rings and therefore are made with curvature. As a result, this technique is not sufficient in view of effective use of the sheet material **21**.

Further, continuous discarding of wasteful material does not match the current general atmosphere considering global environment, and further the wasteful material should be further reduced.

SUMMARY OF THE INVENTION

This invention has been made in view of foregoing and intends to a speaker gasket and its manufacturing method capable of significantly reducing wasteful material in manufacturing, and a speaker device offering high reliability.

In this invention, to solve the above problems, a speaker gasket is formed in a rectangle sheet with a flat opening of a girth of a prescribed length at the center.

As a result, since the speaker gasket has not curvature, wasteful material remained after cutting a sheet material can be significantly reduced.

Further, in this invention, speaker gaskets are produced by cutting the sheet material made of prescribed material into a plurality of rectangular areas arranged in a matrix in a plane and creating a flat opening of a girth of a prescribed length at the center of each rectangular area.

As a result, with this speaker gasket manufacturing method, wasteful part remained after cutting a sheet material into speaker gaskets can be significantly reduced because the speaker gaskets (rectangular areas) made by cutting the sheet material has no curvature.

Furthermore, in this invention, a speaker device is provided with a gasket formed in a rectangular sheet and having a flat opening of a girth of a prescribed length at the center, and a frame having a gasket holding means formed around its edge opening to hold the gasket. The gasket is deformed and attached along the opening of the frame and the gasket holding means of the frame holds the gasket so as to keep its deformed state.

As a result, this speaker device can effectively prevent the frame from coming off due to stress generated inside by the deformation of the gasket attached to the frame while significantly reducing wasteful parts remained after cutting the sheet material into gaskets.

The nature, principle and utility of the invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings in which like parts are designated by like reference numerals or characters.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. **1** is a cross-sectional view showing a construction of a conventional cone speaker;

FIG. **2** is a perspective view explaining a conventional manufacturing method of a gasket;

FIG. **3** is a cross sectional view showing a construction of a cone speaker according to this embodiment;

FIG. **4** is a perspective view showing a specific construction of a gasket according to this embodiment;

FIG. **5** is a perspective view showing deformation of the gasket;

FIG. **6** is a front view explaining stress generated in the deformed gasket;

FIGS. **7**A to **7**C are perspective views explaining a manufacturing procedure of a gasket according to this embodiment; and

FIG. **8** is a front view showing another embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENT

Preferred embodiments of this invention will be described with reference to the accompanying drawings:

(1) Construction of Cone Speaker According to this Embodiment

In FIG. **3** where the same reference numerals are applied to parts corresponding to those of FIG. **1**, reference numeral **30** shows a cone speaker according to this embodiment. This speaker **30** is identical to the above-described conventional cone speaker **1**, excepting for the constructions of a frame **31**, an edge **32**, and a gasket **33**.

In actual, in a case of this cone speaker **30**, an annular projection **31**A of a prescribed height is formed along a part close to the edge of the inner side of the frame **31**. And an edge **32** shaped like the conventional edge **3** (FIG. **1**) without its outer circumference part is fixed to the frame **31** by being attached to this projection **31**A.

In addition, at the edge forming the edge opening of the frame **31**, an annular groove **31**B of a prescribed width is formed along the opening. The gasket **33** is attached by being stuck on the double-stick sheet **34** stuck on the bottom of the groove **31**B.

In this case, as shown in FIG. **4**, the gasket **33** is formed in a rectangular sheet with, at the center, a flat opening **33**A, such as elliptic opening, of a girth of a prescribed length which is the same or a little shorter than the girth of the inner wall of the groove **31**B of the frame **31**. Then as shown in FIG. **5**, the gasket **33** is stretched in a shorter diameter direction of the opening **33**A and is attached by being inserted in the groove **31**B of the frame **31**.

Thereby, against stress as shown by an arrow b in FIG. **6**, which makes the gasket **33** return to the original shape and is generated in the gasket **33** deformed and attached to the frame **31**, the cone speaker **30** can keep the gasket **33** in the deformed state by the inner wall **31**BX of the groove **31**B of the frame **31**, thus being capable of previously and effectively preventing the gasket **33** from coming off the frame **31** due to the stress.

In addition, as clear from FIG. **4**, the four corners of the gasket **33** are cut off, so that strain in each corner having large loads caused by the deformation can be reduced when the gasket **33** is deformed when inserted in the groove **31**B of the frame **31** as described above.

(2) Gasket Manufacturing Procedure According to this Embodiment

The gasket **33** to be used in the cone speaker **30** according to the embodiment can be produced in the following procedure shown in FIGS. **7**A to **7**C.

That is, as shown in FIG. **7**A, a double-stick sheet **41** is stuck on one surface **40**A of the sheet material **40** made of a foam macromolecult material or a deformable and flexible material such as rubber, and then as shown in FIG. **7**B, this sheet material **40** is cut into a plurality of rectangular areas **40**B (areas shown by an oblique line in FIG. **7**B) arranged in a matrix in a plane without gap.

At this time, as shown in FIGS. **7**B and **7**C, each rectangular area **40**B is taken off the sheet material **40** with cutting off the four corners and creating an elliptic opening **40**C at the center, so that the rectangular area **40**B can be used as a gasket as it is. In this way, the rectangular area **40**A can be used as the gasket **33** as described above with reference to FIG. **4**.

(3) Operation and Effects of this Invention

In the above configuration, for the cone speaker **30** according to this embodiment, the gaskets **33** are formed in a rectangular shape, so that the gaskets **33** can be produced by cutting the sheet material **40** into a plurality of rectangular areas **40**B arranged in a matrix in a plane without gap.

Therefore, since each gasket **33** used in the cone speaker **30** according to this embodiment has no curvature, the sheet material **40** can be used effectively in manufacturing because parts other than the four corners and the inside of the openings **40**C of the rectangular areas **40**B are used as gaskets.

Thus, since the gasket **33** is formed in such a shape, as compared with a conventional case, the amount of wasteful material can be significantly reduced (to about 50%), resulting in creating more number of gaskets from one sheet material **40**.

Further, in the cone speaker **30** according to this embodiment, a gasket made in the above described manner is deformed and attached to the frame **31** by being inserted in the groove **31**B formed on the edge of the frame **31**. Therefore, the stress which makes the gasket **33** return to the original shape and is generated in the gasket **33** by this deformation is supported by the inner wall **31**BX of the groove **31**B, thereby previously and effectively preventing the gasket **33** from coming off the frame **31**.

According to the above configuration, the gasket **33** is formed in a rectangular shape, so that wasteful parts remained after cutting the sheet material **40** into gaskets **33** can be significantly reduced, thus making it possible to realize a gasket capable of significantly reducing the amount of wasteful material in manufacturing.

Furthermore, the groove **31**B is provided at the edge of the frame **31** and the gasket **33** is attached to the frame **31** by being inserted in the groove **31**B. This can effectively prevent the gasket **33** from coming off the frame **31**, thus making it possible to make a cone speaker offering high reliability.

(4) Other Embodiments

Note that the above embodiment has described a case where this invention is applied to an external magnet type cone speaker **1**. This invention, however, is not limited to this and can be widely applied to speaker devices of other types, including inner magnet type cone speakers.

Further, the above embodiment has described a case where the shape of the opening **33**A formed at the center of the gasket **33** is elliptic. This invention, however, is not limited to this and the opening **33**A have various shapes, provided that the opening is a flat opening of which the girth is the same or a little shorter than that of the inner wall of the groove **31**B of the frame **31**.

Furthermore, the above embodiment has described a case where the groove **31**B is formed at the edge of the frame **31** as a gasket holding means for holding the gasket **33** in its deformed state along the edge opening of the frame **31**. This invention, however, is not limited to this and a projection can be formed along the edge opening of the frame **31**. Alternatively, as shown in FIG. **8**, projections **50** are formed around a circuit along the edge opening of the frame **31**.

While there has been described in connection with the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be aimed, therefore, to cover in the appended claims all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A cone speaker having a vibratory edge couplable to a frame, the cone speaker comprising:

a gasket formed in a rectangular sheet with a flat opening of a girth of a prescribed length at a center, the rectangular sheet having two long sides and two short sides; and

a flame-comprising a gasket holding means formed along an edge opening to hold the gasket and a region configured to hold the vibratory edge, the gasket holding means being separate and spaced from the region configured to hold the vibratory edge, wherein

the gasket is deformable whereby the opening deforms from a first opening configuration to a second opening configuration generally corresponding to the edge opening and attachable along the edge opening of the frame; and

the gasket holding means of the frame holds the gasket and keeps the gasket deformed so that the opening remains in the second opening configuration

wherein the gasket holding means is an annular groove formed at an edge of the frame, and

wherein the vibratory edge is held to the frame separately from the gasket.

2. The speaker-according to claim **1**, wherein corners between the two long sides and the two short sides are cut off.

3. The speaker-according to claim **1**, wherein the opening in the first opening configuration is generally elliptical in shape.

4. A cone speaker having a vibratory edge couplable to a frame, the cone speaker comprising:

a frame having at least one gasket retainer and a region configured to hold the vibratory edge, the gasket retainer defining an outer perimeter and being separate and spaced from the region configured to hold the vibratory edge; and

a gasket formed with an opening having a first inner perimeter, said opening having an undefined configuration wherein said first inner perimeter of the opening is less than the outer perimeter and wherein the gasket is deformable such that said opening is expandable to a have a deformed configuration to define a second perimeter whereby said second perimeter approximates the outer perimeter;

wherein the at least one gasket retainer comprises an annular groove formed at an edge of the frame, and

wherein the vibratory edge is held to the frame separately from the gasket.

5. The speaker according to claim **4**, wherein the gasket is formed in a rectangular sheet having two long sides and two short sides.

6. The speaker according to claim **5**, wherein corners between the two long sides and the two short sides are cut off.

7. The speaker according to claim **4**, wherein the first inner perimeter of the opening is generally elliptical in shape.

8. A cone speaker having a vibratory edge couplable to a frame, the cone speaker comprising:

a frame having at least one gasket retainer and a region configured to hold the vibratory edge, the gasket retainer defining an outer perimeter and being separate and spaced from the region configured to hold the vibratory edge; and

a gasket formed with an opening having a first inner perimeter, said opening having an undeformed configuration wherein said first inner perimeter of the opening is less than the outer perimeter and wherein the gasket is deformable such that said opening is expandable to a have a deformed configuration to define a second perimeter whereby said second perimeter approximates the outer perimeter;

wherein the at least one gasket retainer comprises a plurality of projections formed at an edge of the frame, the plurality of projections separating the gasket retainer from the region configured to hold the vibratory edge, and

wherein the vibratory edge is held to the frame separately from the gasket.

9. The speaker according to claim **8**, wherein the gasket is formed in a rectangular sheet having two long sides and two short sides.

10. The speaker according to claim **9**, wherein corners between the two long sides and the two short sides are cut off.

11. The speaker according to claim **8**, wherein the first inner perimeter of the opening is generally elliptical in shape.

12. The speaker according to claim **8**, wherein the region configured to hold the vibratory edge comprises an annular projection.

* * * * *